

FORM PTO-1390 (Modified)
(REV 11-2000)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

212638US0PCT

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

09/913717INTERNATIONAL APPLICATION NO.
PCT/JP00/01088INTERNATIONAL FILING DATE
February 25, 2000PRIORITY DATE CLAIMED
February 25, 1999 (earliest)

TITLE OF INVENTION

COPOLYMER, VIBRATION-DAMPING MATERIAL, VIBRATION-DAMPING PART AND COMPOSITION FOR COPOLYMER

APPLICANT(S) FOR DO/EO/US

NAKAMURA Hiroki et al.

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include items (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is attached hereto (required only if not communicated by the International Bureau).
 - b. ☒ has been communicated by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
 - a. ☒ is attached hereto.
 - b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are attached hereto (required only if not communicated by the International Bureau).
 - b. ☐ have been communicated by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☒ have not been made and will not be made.
8. ☐ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes of the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☐ Certificate of Mailing by Express Mail
23. ☒ Other items or information:

Notice for Consideration of Documents Cited in International Search Report/Notice of Priority
PCT/IB/304/Drawings (1 sheet)/PCT/IB/308

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 09/913717)	INTERNATIONAL APPLICATION NO. PCT/JP00/01088	ATTORNEY'S DOCKET NUMBER 212638US0PCT
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24. The following fees are submitted:

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **\$1000.00**
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **\$860.00**
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **\$710.00**
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) **\$690.00**
- ☐ International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) **\$100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT =**CALCULATIONS PTO USE ONLY****\$860.00**

Surcharge of **\$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$0.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	5 - 20 =	0	x \$18.00
Independent claims	2 - 3 =	0	x \$80.00

\$0.00**\$0.00**Multiple Dependent Claims (check if applicable). ☐**\$0.00****TOTAL OF ABOVE CALCULATIONS =****\$860.00**

☐ Applicant claims small entity status. (See 37 CFR 1.27). The fees indicated above are reduced by 1/2.

\$0.00**SUBTOTAL =****\$860.00**

Processing fee of **\$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00**TOTAL NATIONAL FEE =****\$860.00**

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). ☐

\$0.00**TOTAL FEES ENCLOSED =****\$860.00****Amount to be:****\$****refunded****\$**

- a. ☒ A check in the amount of **\$860.00** to cover the above fees is enclosed.
- b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.
- c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **15-0030**. A duplicate copy of this sheet is enclosed.
- d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

**22850**

William E. Beaumont
SIGNATURE **WILLIAM E. BEAUMONT**
REGISTRATION NUMBER **30,590**

Norman F. Oblon

NAME

24,618

REGISTRATION NUMBER

August 17, 2001
DATE

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09/913717
2001 Rev'd to TO 17 AUG 2001

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :
HIROKI NAKAMURA ET AL : ATTN: APPLICATION DIVISION
SERIAL NO: NEW U.S. PCT APPLN :
(Based on PCT/JP00/01088)
FILED: HEREWITH :
FOR: COPOLYMER, VIBRATION- :
DAMPING MATERIAL, :
VIBRATION-DAMPING PART :
AND COMPOSITION FOR :
COPOLYMER

PRELIMINARY AMENDMENT

ASSISTANT COMMISSIONER FOR PATENTS
WASHINGTON, D.C. 20231

SIR:

Prior to examination on the merits, please amend the above-identified application as follows.

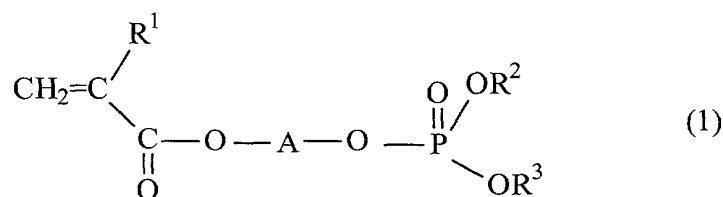
IN THE CLAIMS

Please cancel Claim 2.

Please amend the claims as shown on the marked-up copy following this amendment to read as follows.

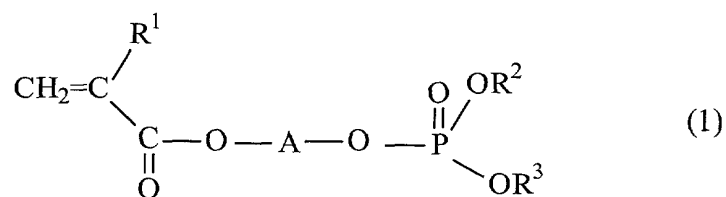
1. (Amended) A copolymer composed of from 20 to 100% by weight of at least one phosphate monomer (a) unit of the following general formula (1), from 0 to 80% by weight of at least one (meth)acrylate monomer (b) unit, and from 0 to 30% by weight of the other

monomer (c) unit copolymerizable with them, and the glass transition temperature of the copolymer is 80°C or less:



wherein, R¹ in the formula represents hydrogen atom or methyl group, each R² and R³ independently represents hydrogen atom, or an alkyl group or an alkyl ether group having from 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.

6. (Amended) A raw material composition for preparing a vibration-damping material, which is composed of from 20 to 100% by weight of at least one phosphate monomer (a) of the following general formula (1), from 0 to 80% by weight of at least one (meth)acrylate monomer (b), and from 0 to 30% by weight of the other monomer (c) copolymerizable with them:



wherein, R¹ in the formula represents hydrogen atom or methyl group, each R² and R³ independently represents hydrogen atom, or an alkyl group or an alkyl ether group having

form 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.

REMARKS

Claims 1 and 3-6 are active in the present application. Claim 2 has been cancelled. Claims 1 and 6 have been amended. Support for amended Claim 1 is found on page 8, lines 20-24. Support for amended Claim 6 is found in Figure 1 and in the specification on page 10, line 15, through page 11, line 19. No new matter is added. An action on the merits and allowance of claims is solicited.

Respectfully submitted,
OBLON, SPIVAK, McCLELLAND,
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JCS Patent Office 17 AUG 2001

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Serial No:

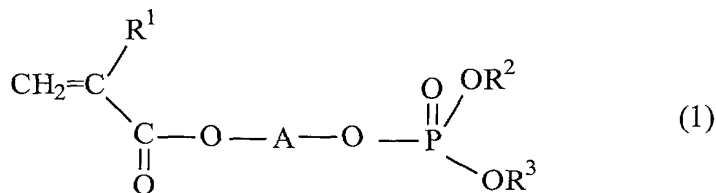
Amendment Filed on:

08/17/01

IN THE CLAIMS

Please cancel Claim 2.

--1. (Amended) A copolymer composed of from 20 to 100% by weight of at least one phosphate monomer (a) unit of the following general formula (1), from 0 to 80% by weight of at least one (meth)acrylate monomer (b) unit, and from 0 to 30% by weight of the other monomer (c) unit copolymerizable with them, and the glass transition temperature of the copolymer is 80°C or less:

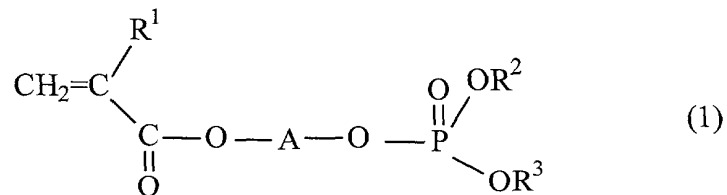


wherein, R¹ in the formula represents hydrogen atom or methyl group, each R² and R³ independently represents hydrogen atom, or an alkyl group or an alkyl ether group having from 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.

6. (Amended) A raw material composition for preparing a vibration-damping material, which is composed of from 20 to 100% by weight of at least one phosphate monomer (a) of the following general formula (1), from 0 to 80% by weight of at least one

(meth)acrylate monomer (b), and from 0 to 30% by weight of the other monomer (c)

copolymerizable with them:



wherein, R¹ in the formula represents hydrogen atom or methyl group, each R² and R³ independently represents hydrogen atom, or an alkyl group or an alkyl ether group having from 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.--

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JCO3 Rec'd 17 AUG 2001

DESCRIPTION

COPOLYMER, VIBRATION-DAMPING MATERIAL, VIBRATION-DAMPING PART AND COMPOSITION FOR COPOLYMER

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Technical Field

The present invention relates to a copolymer excellent in vibration-damping property, flame retardancy and transparency, a vibration-damping material and a vibration-damping part composed of this copolymer, and a composition for copolymer.

10

Background Art

Conventionally, there are used a lot of vibration-damping polymer materials utilizing polymer viscoelastic behavior for reducing vibration of metals and the like. Since a vibration-damping material is usually used in the state that it is adhered to a hard substrate such as a metal, acrylic resin-based vibration-damping materials excellent in adhesion have been investigated frequently. For example, JP-A No. 4-202586 discloses a cross-linkable copolymer made of 75 to 92% by weight of a monomer necessarily composed of an alkyl acrylate having C8-12 alkyl group and 8 to 25% by weight of a carboxyl group-containing monomer which a polymer obtained by homo-polymerization of this monomer has a glass transition temperature of 50°C or

15

20

25

more.

Recently, vibration-damping materials are variedly used, and it is required to have various abilities such as transparency, rigidity, impact resistance and weather resistance in addition to conventional vibration-damping property. Particularly, an acrylic resin-based vibration-damping material is often required to have flame retardancy, and it is desired to achieve a vibration-damping materials having both vibration-damping property and flame retardancy.

Usually, the flame retardancy of resin is imparted by blending a flame retarder. In a general method, an organic flame retarder such as phosphorus-based retarders, nitrogen-based retarders and halogen-based retarders, and an inorganic flame retarder such as antimony trioxide and aluminum hydroxide are used as the flame retarder, and these are blended in the resin. However, when a large amount of flame retarder is added for enhancing flame retardancy, problems should occur, for example, that a flame retarder bleeds onto the surface of the resin to deteriorate transparency, and that the other properties such as mechanical strength are remarkably reduced. Further, when a halide is used as the flame retarder, toxicity thereof is problematical. There are various investigation for solving these problems, and for example, JP-A No. 7-82324 discloses a copolymer made of a monomer which can produce

a transparent polymer when polymerized singly, and a monomer having a polymerizable unsaturated double bond containing phosphorus.

However, the copolymer disclosed in JP-A No. 7-82324
5 is a hard material used mainly for grazing, and the material cannot be applied to uses requiring flame retardancy and vibration-damping property simultaneously.

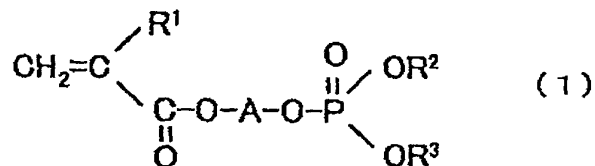
Disclosure of Invention

10 An object of the present invention is to provide a copolymer excellent in vibration-damping property, flame retardancy and transparency, a vibration-damping material and a vibration-damping part composed of this copolymer, and a copolymer composition.

15 The present inventors have intensively studied for attaining the above-mentioned object, and resultantly found that transparency, flame retardancy and vibration-damping property can be imparted by copolymerizing a phosphorus-containing compound having a specific structure
20 with a (meth)acrylate monomer, leading to completion of the present invention.

Namely, the present invention is a copolymer composed of from 20 to 100% by weight of at least one phosphate monomer (a) unit of the following general formula (1),
25 from 0 to 80% by weight of at least one (meth)acrylate monomer (b) unit, and from 0 to 30% by weight of the other

monomer (c) unit copolymerizable with them:



wherein, R^1 in the formula represents hydrogen atom or methyl group, each R^2 and R^3 independently represents hydrogen atom, or an alkyl group or an alkyl ether group having from 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.

Further, the present invention provide a vibration-damping material and a vibration-damping part composed of the above-mentioned copolymer.

Furthermore, the present invention provide a composition composed of from 20 to 100% by weight of at least one phosphate monomer (a) of the above-mentioned general formula (1), from 0 to 80% by weight of at least one (meth)acrylate monomer (b), and from 0 to 30% by weight of the other monomer (c) copolymerizable with them.

In the present invention, "(meth)acrylate" means "acrylate and/or methacrylate".

Brief Explanation of Drawing

Fig. 1 shows one example of a vibration-damping part composed of a copolymer of the present invention.

Best Mode for Carrying Out the Invention

5 The phosphate monomer (a) constituting the copolymer of the present invention is represented by the above-mentioned general formula (1). Specific examples thereof include (2-hydroxyethyl) acrylate acid phosphate, (2-hydroxyethyl) methacrylate acid phosphate, (2-hydroxypropyl) acrylate acid phosphate, (2-hydroxypropyl) methacrylate acid phosphate, (3-hydroxypropyl) acrylate acid phosphate, (3-hydroxypropyl) methacrylate acid phosphate, 10 diphenyl-2-acryloyloxyethyl phosphate and diphenyl-2-methacryloyloxyethyl phosphate. These may also be used in combination of two or more.

15 Of them, diphenyl-2-methacryloyloxyethyl phosphate is preferable from the standpoints of copolymerization property and compatibility with other monomers. Namely, it is preferable to use, as at least one phosphate monomer (a), diphenyl-2-methacryloyloxyethyl phosphate singly, or to use this together with the above-mentioned other phosphate monomer. In the explanation of the invention, a polymer 20 composed of 100% by weight of one kind of phosphate monomer (a) unit is also explained expedientially as the copolymer. Namely, the expression "copolymer" may mean "polymer" in some cases.

25 The copolymer of the present invention contains a phosphate monomer (a) unit in a proportion of 20% by weight or more. When less than 20% by weight, sufficient

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vibration-damping property can not be manifested, and
close adherence to hard parts made of metals and the like
and flame retardancy also deteriorate. This amount is
preferably 25% by weight or more, further preferably 30%
5 by weight or more.

In the present invention, disclosed as examples of
the (meth)acrylate monomer (b) are methyl (meth)acrylate,
ethyl (meth)acrylate, isopropyl (meth)acrylate, butyl
(meth)acrylate, 2-ethylhexyl (meth)acrylate, phenyl (meth)
10 acrylate and benzyl (meth)acrylate. These may also be used
in combination of two or more.

The copolymer of the present invention contains a
(meth)acrylate monomer (b) unit in a proportion of from 0
to 80% by weight.

15 As the copolymer of the present invention, those com-
posed of a phosphate monomer (a) unit and a (meth)acrylate
monomer (b) unit are preferable. From the standpoint of
manifestation of the vibration-damping property of the co-
polymer, the content of the (meth)acrylate monomer (b)
20 unit in the copolymer is preferably 75% by weight or less,
further preferably 70% by weight or less.

For manifestation of excellent vibration-damping
property of the copolymer of the present invention, it is
preferable that the glass transition temperature of the
25 copolymer (hereinafter, the glass transition temperature
of a copolymer or polymer is referred to as "Tg", expedi-

entially) is lower than the use temperature T_u of the copolymer, and more preferably, the difference of T_u and T_g is 20°C or more. T_g of the copolymer can be lowered by inclusion a monomer unit in the copolymer wherein the monomer gives lower T_g of a polymer obtained by homopolymerization thereof than T_g of a polymer obtained by homopolymerization of a phosphate monomer (a) unit. From such a standpoint, a (meth)acrylate monomer (b) unit is preferably selected. When two or more (meth)acrylate monomer (b) units are used together, it is preferable to select at least one component according to such a standpoint.

In a copolymer composed of these phosphate monomer (a) unit and (meth)acrylate monomer (b) unit, the content of the (meth)acrylate monomer (b) unit is preferably 10% by weight or more, further preferably 20% by weight or more. Namely, the content of the phosphate monomer (a) unit is preferably 90% by weight or less, further preferably 80% by weight or less.

The copolymer of the present invention can contain the other monomer (c) unit as a tertiary component in a proportion of from 0 to 30% by weight which does not reduce the properties of the copolymer, in addition to the above-mentioned two component. The other monomer (c) unit is not particularly restricted. For example, unsaturated carboxylic acids such as acrylic acid, methacrylic acid, maleic acid and itaconic acid; acid anhydrides such as

maleic anhydride and itaconic anhydride; maleimide derivatives such as N-phenylmaleimide, N-cyclohexylmaleimide and N-t-butylmaleimide; hydroxyl group-containing monomers such as 2-hydroxypropyl acrylate, 2-hydroxyethyl acrylate and 2-hydroxypropyl methacrylate; nitrogen-containing monomers such as (meth)acrylamide, (meth)acrylonitrile, diacetoneacrylamide and dimethylaminoethyl methacrylate; epoxy group-containing monomers such as allyl glycidyl ether, glycidyl acrylate and glycidyl methacrylate; styrene-based monomers such as styrene and α -methylstyrene; and the like can be used.

It is preferable that the copolymer of the present invention is cross-linked, and if necessary, it can contain a cross-linkable monomer unit. Examples of the typical cross-linkable monomer unit include ethylene glycol diacrylate, allyl acrylate, ethylene glycol di(meth)acrylate, allyl (meth)acrylate, divinylbenzene, trimethylolpropane tri(meth)acrylate, 1,3-butylene di(meth)acrylate and hexamethylene diacrylate.

Further, it is preferable that Tg of the copolymer of the present invention is 80°C or less. When Tg is lowered appropriately, vibration-damping property tends to be improved. Tg is more preferably 50°C or less, particularly preferably 20°C or less.

At 25°C as the usual use temperature, it is preferable that $\tan\delta$ of the copolymer of the present invention

is 0.5 or more under the condition of 10 hz.

When environmental pollution is taken into consideration, it is preferable that the copolymer of the present invention does not contain a halogen atom.

5 The composition of the present invention is composed of from 20 to 100% by weight of at least one phosphate monomer (a), from 0 to 80% by weight of at least one (meth)acrylate monomer (b), and from 0 to 30% by weight of the other monomer (c) copolymerizable with them. As the
10 specific examples of these monomers (a) to (c), the above-mentioned monomers are listed. Further, the composition can contain the above-mentioned cross-linkable monomer. In the present invention, a material of single component composed of 100% by weight of one phosphate monomer (a) is
15 also referred to as "composition", expedientially.

 The viscosity of this composition can be controlled by previously polymerizing a part of the monomer or the monomer mixture, or by adding a suitable high molecular weight polymer or a thickening agent. Further, if necessary, a chain transfer agent, a coloring agent, an ultra-
20 violet absorber, a heat stabilizer, an antistatic agent, a rubbery polymer and fillers such as an inorganic filler can be added.

 The copolymer of the present invention can be produced by a known method such as emulsion polymerization,
25 solution polymerization and bulk polymerization. Of them,

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a bulk polymerization is particularly preferable, and in this case, a copolymer can be produced by using a polymerizable raw material obtained by adding a radical polymerization initiator to the above-mentioned composition, and polymerizing this.

As the radical polymerization initiator, known azo compounds or organic peroxides etc. can be used. As the azo compound, 2,2'-azobisisobutyronitrile, 2,2'-azobis(2,4-dimethylvaleronitrile), 2,2'-azobis(2,4-dimethyl-4-methoxyvaleronitrile) and the like are listed. As the organic peroxide, benzoyl peroxide, lauroyl peroxide, t-hexyl peroxyphthalate and the like are listed. Further, polymerization initiators of redox type, for example, combinations of organic peroxides and amines can also be used.

A polymerizable raw material containing such a radical polymerization initiator added can be, for example, poured between two facing inorganic glass plates or metal plates of which peripheral parts are sealed with a gasket and thermally polymerized to obtain a polymer in the form of a plate, or poured into a part cavity optionally shaped and polymerized under this condition.

The copolymer of the present invention is excellent particularly in vibration-damping of hard parts such as metals, and is suitable as a vibration-damping material. Specifically, the copolymer can be used as a vibration-damping part giving a structure in which the copolymer is

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sandwiched between two hard parts, a structure in which the copolymer is filled in a cavity of a hard part, a structure in which the copolymer is laminated to a hard part, and the like. As the use field of the vibration-damping part, there are listed transportation machine field such as engines, engine covers, bodies of an automobile, tractor and bulldozer; field of domestic electric appliances using a motor such as a washing machine, refrigerator, cleaner and air conditioner; field of OA appliances using a motor such as a personal computer and printer; precise machine field such as a measuring appliance; construction field of an earthquake damper and piping connection; life field as interiors such as ceiling and wall; and the like.

For example, when a vibration-damping material 2 composed of the copolymer of the present invention is filled between two steel tubes 1 placed concentrically as shown in Fig. 1, excellent vibration-damping property can be obtained.

Next, the present invention will be illustrated further specifically by examples, but the scope of the present invention is not limited by these examples. In the examples, "part" is by weight unless otherwise stated. Properties in the examples were evaluated by the following methods.

1) Glass transition temperature (T_g)

Tg of a copolymer resulted was measured by a differential scanning calorimeter DSC200 (manufactured by Seiko Denshi Kogyo K.K.).

2) Vibration-damping property ($\tan \delta$)

5 A copolymer resulted was cut into a disklike form having a thickness of 3 mm and a diameter of 2.5 cm, and $\tan \delta$ (loss tangent) at 25°C and 10 Hz was measured by using a rheometer RDA-700 (manufactured by Rheometric Scientific FE K.K.).

10 [Example 1]

To a composition composed of a mixture of 53 parts of diphenyl-2-methacryloyloxyethyl phosphate (manufactured by Daihachi Kagaku Kogyo K.K., trade name: MR260) and 47 parts of 2-ethylhexyl acrylate was added 0.2 parts of a polymerization initiator t-hexylperoxypivalate, to give a polymerizable raw material. The polymerizable raw material was subjected to pressure reduction to remove remaining air, then poured into a cell having a thickness of 4.2 mm formed by two stainless plates having a longitudinal size of 460 mm and a transverse size of 610 mm and having inner surfaces to which a Teflon film had been pasted, the peripheral parts thereof being sealed with a gasket. It was polymerized in hot water of 65°C for 120 minutes, and further polymerized under air atmosphere of 100°C for 60 minutes, to obtain a polymer in the form of plate having a thickness of 3 mm. The flame retardancy of this plate

polymer was measured according to UL-94 standard, to find it was V-0.

[Example 2]

The same procedure was conducted as in Example 1 to obtain a plate polymer, except that 53 parts of diphenyl-2-methacryloyloxyethyl phosphate, 27 parts of 2-ethylhexyl acrylate and 20 parts of methyl methacrylate were used as a composition, and 0.065 parts of 2,2'-azobisisobutyronitrile was used as a polymerization initiator.

[Example 3]

The same procedure was conducted as in Example 1 to obtain a plate polymer, except that 43 parts of diphenyl-2-methacryloyloxyethyl phosphate, 47 parts of 2-ethylhexyl acrylate and 10 parts of (2-hydroxyethyl) methacrylate acid phosphate (manufactured by Johoku Kagaku Kogyo K.K., trade name JPA-514) were used as a composition.

[Example 4]

The same procedure was conducted as in Example 1 to obtain a plate polymer, except that 30 parts of diphenyl-2-methacryloyloxyethyl phosphate and 70 parts of butyl acrylate were used as a composition.

[Example 5]

The same procedure was conducted as in Example 1 to obtain a plate polymer, except that 2 parts of benzoyl peroxide (manufactured by Kayaku Akuzo K.K., trade name:

Kadox B-CH50) and 0.2 parts of N,N'-dimethylaniline were used as a polymerization initiator and polymerization was conducted for 180 minutes under an air atmosphere of 23°C instead of polymerization in hot water of 65°C for 120 minutes.

[Example 6]

The same procedure was conducted as in Example 1 to obtain a plate polymer, except that 0.5 parts of hexamethylene diacrylate was further added as a cross-linking agent to the composition. The resulted polymer was not dissolved in a solvent such as acetone and tetrahydrofuran at all so that it was confirmed that this polymer was a cross-linked body.

T_g and tan δ of the plate polymers in Examples 1 to 6 are shown in Table 1.

[Comparative Examples 1 to 3]

The same procedure was conducted as in Example 1 to obtain plate polymers, except that those described in Table 1 were used as a composition, and 0.5 parts of hexamethylene diacrylate was added as a cross-linking agent. T_g and tan δ of these plate polymers are shown in Table 1. All of the plate polymers had lower tan δ as compared with the plate polymers obtained in Examples, and was not preferable as a vibration-damping material

Table 1

	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Comp. Ex. 1	Comp. Ex. 2	Comp. Ex. 3
Diphenyl-2-methacryloyloxyethyl phosphate	53	53	43	30	53	53	0	0	0
2-Ethylhexyl acrylate	47	27	47	0	47	47	100	80	0
Methyl methacrylate	0	20	0	0	0	0	0	20	0
Butyl acrylate	0	0	0	70	0	0	0	0	100
(2-Hydroxyethyl) methacrylate acid phosphate	0	0	10	0	0	0	0	0	0
Glass transition temperature (°C)	-35	-5	-39	-30	-35	-30	-80	-55	-50
$\tan \delta$ (25°C)	0.8	1.2	0.8	0.8	0.8	0.8	0.2	0.5	0.2

Industrial Applicability

The copolymer of the present invention is excellent in balance of transparency, flame retardancy and vibration-damping property, and can be used in various fields such as a vibration-damping material, sound insulation plate, paint, adhesive and various improvers. By polymerizing the composition of the present invention, the above-mentioned copolymer can be obtained easily.

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0001371.081701

Parameter	Control (n=10)	17β-OH Progesterone (n=10)
(a) Uterine weight (g)	0.85 ± 0.05	0.75 ± 0.05*
(b) Uterine length (cm)	4.5 ± 0.2	5.5 ± 0.2*
(c) Uterine volume (ml)	1.5 ± 0.1	2.5 ± 0.1*
(d) Uterine weight (g)	1.5 ± 0.1	2.5 ± 0.1*
(e) Uterine length (cm)	5.5 ± 0.2	6.5 ± 0.2*
(f) Uterine volume (ml)	2.5 ± 0.1	3.5 ± 0.1*
(g) Uterine weight (g)	2.5 ± 0.1	3.5 ± 0.1*
(h) Uterine length (cm)	6.5 ± 0.2	7.5 ± 0.2*
(i) Uterine volume (ml)	3.5 ± 0.1	4.5 ± 0.1*
(j) Uterine weight (g)	3.5 ± 0.1	4.5 ± 0.1*
(k) Uterine length (cm)	7.5 ± 0.2	8.5 ± 0.2*

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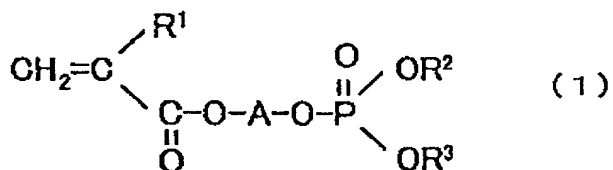
at 25°C and 10 Hz is 0.5 or more.

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of Claim 1.

6. A composition composed of from 20 to 100% by

weight of at least one phosphate monomer (a) of the following general formula (1), from 0 to 80% by weight of at least one (meth)acrylate monomer (b), and from 0 to 30% by weight of the other monomer (c) copolymerizable with them:

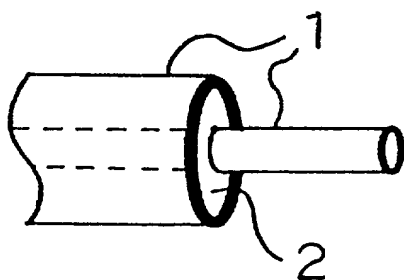


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wherein, R^1 in the formula represents hydrogen atom or methyl group, each R^2 and R^3 independently represents hydrogen atom, or an alkyl group or an alkyl ether group having from 1 to 8 carbon atoms, or an aryl group, and A represents an alkylene group having from 2 to 14 carbon atoms or a polyoxyalkylene group.

FIG. 1



Declaration and Power of Attorney For Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者（下記の名称が複数の場合）であると信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

COPOLYMER, VIBRATION-DAMPING

MATERIAL, VIBRATION-DAMPING PART AND

COMPOSITION FOR COPOLYMER

the specification of which

☒ is attached hereto.

☒ was filed on February 25, 2000

as United States Application Number or

PCT International Application Number

PCT/JP00/01088 and was amended on

_____ (if applicable).

上記発明の明細書は、

☐ 本書に添付されています。

☐ ____月____日に提出され、米国出願番号または特許協定条約国際出願番号を____とし、
(該当する場合) _____に訂正されました。

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されたとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Japanese Language Declaration

(日本語宣言書)

私は、米国法典第35編119条 (a) - (d) 項又は365条 (b) 項に基づき下記の、米国以外の国の少なくとも一カ国を指定している特許協力条約365 (a) 項に基づく国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

Prior Foreign Application(s)

外国での先行出願

11-048243	Japan
(Number)	(Country)
(番号)	(国名)
11-215241	Japan
(Number)	(Country)
(番号)	(国名)

私は、第35編米国法典119条 (e) 項に基づいて下記の米国特許出願規定に記載された権利をここに主張いたします。

(Application No.)	(Filing Date)
(出願番号)	(出願日)

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(Application No.)	(Filing Date)
(出願番号)	(出願日)

(Application No.)	(Filing Date)
(出願番号)	(出願日)

私は、私自信の知識に基づいて本宣言書中で私が行なう表明が真実であり、かつ私の入手した情報と私の信じているところに基づく表明が全て真実であると信じていること、さらに故意になされた虚偽の表明及びそれと同等の行為は米国法典第18編第1001条に基づき、罰金または拘禁、もしくはその両方により処罰されること、そしてそのような故意による虚偽の声明を行なえば、出願した、又は既に許可された特許の有効性が失われることを認識し、よってここに上記のごとく宣誓を致します。

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Claimed
優先権主張

25/02/1999	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Day/Month/Year Filed)	Yes	No
(出願年月日)	はい	いいえ
29/07/1999	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Day/Month/Year Filed)	Yes	No
(出願年月日)	はい	いいえ

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.)	(Filing Date)
(出願番号)	(出願日)

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

(Status: Patented, Pending, Abandoned)
(現況: 特許許可済、係属中、放棄済)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Japanese Language Declaration
(日本語宣言書)

委任状：私は下記の発明者として、本出願に関する一切の手続きを米特許商標局に対して遂行する弁理士または代理人として、下記の者を指名いたします。
(弁護士、または代理人の指名及び登録番号を明記のこと)

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith: (list name and registration number)



022850

書類送付先

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(第三以降の共同発明者についても同様に記載し、署名すること)

(Supply similar information and signature for third and subsequent joint inventors.)